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DAVID W TAYLOR NAVAL SHIP RESEARCH AND DEVELOPMENT CE--ETC F/G 11/3
PROPOSED MILITARY SPECIFICATION. PRIMER COATING. ZINC DUST PIGM--ETC(U)
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DTNSROC/TM-28-80-5-1

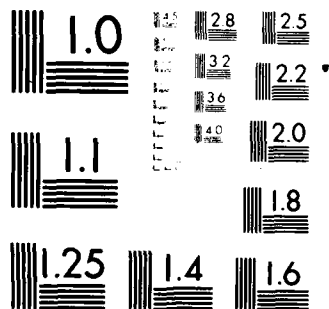
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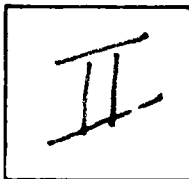


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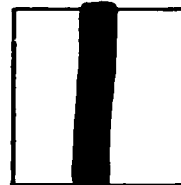
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*David Taylor Naval Ship R&D Center
Annapolis, MD*



INVENTORY

Proposed Military Specification Primer Coating Zinc Dust
Pigmented for Exterior Steel Surfaces

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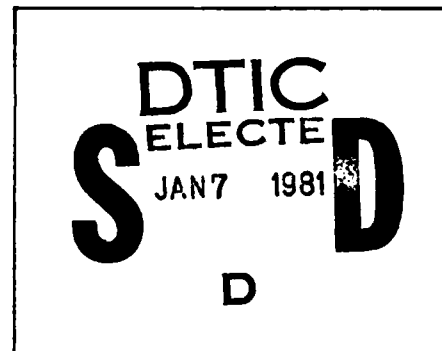
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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		
<i>PROPOSED MILITARY SPECIFICATION ON ZINC PROTECTIVE COATINGS, FIVE YEAR PERFORMANCE, QUALITY CONTROL PROCEDURES, REFERENCED, BACKGROUND USER AGENCY (150) ZINC RICH PAINT COATINGS LISTED.</i>		

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PROPOSED MILITARY SPECIFICATION

PRIMER COATING, ZINC DUST PIGMENTED FOR EXTERIOR STEEL SURFACES

1. SCOPE

1.1 This specification covers zinc containing primers for use on exterior steel surfaces exposed to marine atmosphere, high humidity, sea water, and weathering.

1.2 Classification. The coating shall be of the following types and classes as specified:

Type I - Aqueous solvent

Type II - Organic (hydrocarbon) solvent

Class 1 - Self curing

Class 2 - Post curing

Composition A - Organic vehicle

Composition B - Inorganic vehicle

2. APPLICABLE DOCUMENTS

2.1 The following documents, of the issue in effect on the date of invitation for bids or request for proposal, form a part of this specification to the extent specified herein.

SPECIFICATIONS

FEDERAL

QQ-S-696

TT-E-781

- Steel, Sheet and Strip,
Low-Carbon

- Ethylene Glycol Monoethyl
Ether, Technical

PPP-P-1892

- Paint, Varnish, Lacquer & Related Materials; Packaging Packing and Marking of

TT-T-548

- Toluene, Technical

PP-T-42C

- Tape Packaging/Masking Paper

MILITARY

MIL-P-15929

- Primer Coating, Shipboard, Vinyl-red Lead (Formula No. 119-For Hot Spray)

MIL-H-5606

- Hydraulic Fluid, Petroleum Base, Aircraft, Missile, and Ordnance

STANDARDS

FEDERAL

FED-STD-141

- Paint, Varnish, Lacquer, and Related Materials; Method of Inspection, Sampling and Testing

FED-STD-313

- Material Safety Data Sheets Preparation and the Submission of

FED-STD-595

- Colors

MILITARY

MIL-STD-129

- Marking for Shipment and Storage

(Copies of specifications, standards, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

2.2 Other publications. The following documents form a part of this specification to the extent specified herein. Unless otherwise indicated, the issue in effect on date of invitation for bids or request for proposal shall apply.

AMERICAN SOCIETY FOR TESTING AND MATERIALS - (ASTM)

ASTM-B-117	- Salt Spray (Fog) Testing
ASTM-D-93	- Flash Point by Pensky-Martens Closed Tester, Test for
ASTM-D-185	- Coarse Particles in Pigments, Pastes and Paints, Test for
ASTM-D-520	- Zinc Dust (Metallic Zinc Powder), Spec. for
ASTM-D-521	- Zinc Dust (Metallic Zinc Powder), Chemical Analysis of
ASTM-D-822	- Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Testing Paint, Varnish, Lacquer, and Related Products, Rec. Practice for (See ASTM-G-23)
ASTM-D-1141	- Substitutes Ocean Water; Spec. for
ASTM-D-1296	- Odor of Volatile Solvents and Diluents, Test for
ASTM-D-1308	- Effect of Household Chemicals on Clear and Pigmented Organic Finishes, Test for
ASTM-D-1748	- Humidity Cabinet, Test for
ASTM-D-2197	- Adhesion of Organic Coatings, Test for
ASTM-D-2698	- Pigment Content of Solvent Type Paints by High Speed Centrifuging, Determination of
ASTM-G-23	- Operating Light- and Water-Exposure Apparatus (Carbon-Arc Type) for Exposure of Nonmetallic Materials, Rec. Practice for (see ASTM-D-822)

(Application for copies should be addressed to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.)

NATIONAL ASSOCIATION OF CORROSION ENGINEERS - NACE

NACE STANDARD TM-01-70

- Visual Standards for Surfaces
of New Steel Air Blast Cleaned
with Sand Abrasive

(Application for copies should be addressed to the National Association
of Corrosion Engineers, P.O. Box 986, Katy, Texas 77450.)

GOVERNMENTAL

CODE OF FEDERAL REGULATIONS (CFR's)

Public Law 86-613, Federal Hazardous Substances Labelling Act

(Application for copies should be addressed to the Superintendent of
Documents, US Government Printing Office, Washington, DC 20402.)

Public Law 91-595 - Occupational Safety and Health Act of 1970

(Application for copies should be addressed to Department of Labor,
Occupational Safety and Health Administration, Office of Standards,
Washington, DC 20210.)

3. REQUIREMENTS

3.1 Qualification. The primer furnished under this specification
shall be a product which has been tested and passed the qualification
tests specified herein and approved for listing on the Qualified Product
List.

3.2 Materials. The manufacturer is given latitude in the selection
of raw materials and processes of manufacture but shall be restricted by
the requirements of this specification. The materials used shall be of
high quality and entirely suitable for the purpose intended. The
components when mixed for application, shall have a viscosity suitable
for spray and applications.

3.2.1 Toxic products and formulations. The material shall comply fully with regulations set forth in Public Laws 86-613 and 91-596 and shall have no adverse effect on the health of personnel when used according to provided instructions and for its intended purpose. Questions pertinent to this effect shall be referred by the procuring activity to the appropriate department medical service who will act as an advisor to the procuring agency.

3.2.2 Volatiles. The volatile portion of each component of the primer shall conform to EPA requirements and other applicable regulations such as those of the California Air Resources Board (CARB), enacted and in effect on the date of submission for qualification of the material to this specification (see 5.3.2). A certificate of compliance from the supplier to this effect is necessary.

3.2.3 Thinners. When the liquid vehicle portion of the primer cannot be thinned with water, ethylene glycol monoethyl ether, conforming to TT-E-781 shall be used as required for thinning. If this solvent is not compatible with a specific primer, the manufacturer of that primer will specify a suitable solvent.

3.2.4 Zinc dust pigment. The zinc dust pigment shall conform to the requirements of ASTM-D-520 (see 4.9.1).

3.3 Components. The zinc rich primer shall be a ready-to-mix, one or more component material. Each component, where indicated, shall be furnished in separate containers as part of a kit, each kit comprising a complete application mix. The manufacturer shall specify the components, mixing instructions, application procedure, and health and safety information necessary to assure optimum performance.

3.4 Service. The coating system shall provide satisfactory service for a minimum of five years. Coating failure necessitating removal of more than 5% of any application of the coating system prior to five years shall be cause for disqualification.

3.4.1 Service test. The primer, along with approved Federal or Military Specification topcoat shall be applied to a minimum of 400 square feet on exterior steel surfaces in accordance with manufacturers instructions and 3.4.2. This designated application shall be inspected at 6 months and 1 year by a Navy representative. After 1 year service, qualification shall be recommended if no film failure other than a moderate change in appearance has occurred or spot blast to bare metal of not more than 3% of the coated area is required for refurbishment. Coating failure necessitating more extensive rework at 6 months or at 1 year shall be cause for withholding qualification. Rework associated with surface cleaning such as sweep blast shall not be considered.

3.4.2 Application conditions. The primer and topcoat shall be capable of satisfactory cure and performance when applied under the following conditions:

Application and cure at 45°F to 100°F and 20% to 90% relative humidity.

Time lapse of 6 hours minimum to 26 weeks maximum between coats.

Dry film thickness of 8 to 10 mils for each total system.

Time lapse of 1 day (minimum) from application of last coat to initiation of service.

3.5 Coating compatibility. The primer shall be capable of being recoated both before and after service exposure with the topcoat of the same coating system or any NAVY topcoat approved on date of qualification and when tested as specified in 4.9.13 shall show no more than

1% primer-topcoat separation.

3.6 Mixing. When tested as specified in 4.9.3, the zinc dust pigment or pigmented portion shall be easily mixed, by hand, into the remaining multi-component portions to form a smooth, homogeneous material free from lumps or other objectionable characteristics.

3.7 Odor. When tested as specified in method ASTM-D-1296 the odor of the wet primer and the dry film shall not be obnoxious.

3.8 Coarse particles and skins. When tested in accordance with method ASTM-D-185, the percentage of coarse particles and skins retained on the sieve shall not exceed by more than 0.5 percent the total amount of residue retained when the dry zinc pigment is subjected to the sieve test.

3.9 Primer stability. When tested after standing undisturbed for 4 hours as specified in 4.9.4, the mixed primer shall not have aged or settled to the extent that it cannot be easily redispersed into a smooth, homogeneous mixture by hand mixing. At the time of submission of bid, the components, after one year storage at a temperature of $80^{\circ}\text{F} \pm 10^{\circ}\text{F}$ ($26.7^{\circ}\text{C} \pm 5.6^{\circ}\text{C}$), shall produce a coating which meets all requirements of this specification in the uncured and cured condition.

3.10 Miscibility (Ease of Reduction) with thinner. When tested in accordance with method as specified in 4.9.3.4, primers requiring dilution with organic solvents shall be compatible with ethylene glycol monoethyl ether conforming to TT-E-781 or other solvents specified by manufacturer.

3.11 Flash point. The uncured primer, mixed, thinned if applicable and ready for application, shall not flash at less than 100°F when tested in accordance with ASTM Method D-93.

3.12 Film properties. The primer shall be suitable for application by spraying over sandblasted steel. In one cross-coat, applied by spray, at least 3 mils but not more than 5, in dry film thickness shall be deposited. One hour after application, the coating shall be smooth and even and free of runs, sags, streaks, or other imperfections. The primer shall be thinned in accordance with section 3.2.3 of this specification.

3.13 Drying time.

3.13.1 Class 1. A film of the coating, prepared and tested in accordance with 4.9.5 shall dry dust free in 30 minutes and after 4 hours curing shall not be affected by running tap water. The coating shall be cured ready for service or topcoating 24 hours after application.

3.13.2 Class 2. The coating, prepared and tested in accordance with 4.9.6 shall be dry for application of the recommended curing solution before 2 hours. The cured coating system after 24 hours of curing shall not be affected by running tap water when tested in accordance with 4.9.6. The coating shall be cured ready for service or for topcoating 24 hours after application of the curing solution.

3.14 Flexibility. When tested in accordance with 4.9.7, a film of the primer shall show no cracking or loss of adhesion in the bend area.

3.15 Adhesion. When tested in accordance with 4.9.8, coatings of the primer shall show no lifting, flaking or other signs of loss of adhesion.

3.16 Fluid resistance properties.

3.16.1 Water immersion. When tested as specified in 4.9.9 the primer shall show no wrinkling, blistering, loss of adhesion or other visible defects.

3.16.2 Hydrocarbon immersion. When tested as specified in 4.9.9 a film of the primer shall show no softening, blistering, rusting or other visible defects.

3.16.3 Hydraulic fluid immersion. When tested as specified in 4.9.9 a film of the primer shall show no softening, blistering, rusting or other defects.

3.17 Weathering properties.

3.17.1 Accelerated weathering. When tested as specified in 4.9.10, the primer film shall show only a slight chalking or fading after 1000 hours exposure to accelerated weathering.

3.17.2 Weather exposure. At the time of submission of bid, the manufacturer shall certify that a single coat of the primer, 3 to 5 mil dry film thickness on steel surfaces shall show no loss of adhesion, blistering or pinpoint rusting to an unscribed panel and no loss of adhesion, no blistering, no undercutting and only negligible rusting along the score of a scribed panel when exposed 5 years in a marine atmosphere.

3.17.3 Humidity resistance. When tested in accordance with 4.9.11, a coating of the primer shall show no corrosion, blistering, wrinkling, or loss of adhesion.

3.17.4 Salt spray resistance. When tested in accordance with 4.9.12, a coating of the primer shall show no blistering, wrinkling, or loss of adhesion. There shall be no general surface corrosion, pitting or other visual evidence of panel corrosion.

3.18 Cathodic protection.

3.18.1 Material qualification. For qualification of materials, when tested in accordance with 4.9.15.1, the coating shall

prevent corrosion in the bare metal area during a minimum of 48 hours immersion in synthetic seawater.

3.19 Color. The preferred color of the cured primer is the characteristic metallic color of the zinc pigment which approximates color No. 36231 of Federal Standard No. 595. However, other colors resulting from the use of additional inhibitive pigments shall not be cause for rejection provided the primer meets all other requirements of this specification.

3.20 Identification Characteristics. Nominal values for identification characteristics listed in Table 1 shall be provided by the manufacturer at time of qualification in addition to application and mixing instructions required. These identification characteristics shall be the criteria by which it is determined that the material offered continues to be the same as that which was qualified. The limits given are absolute; that is, the range is as specified regardless of the nominal value.

Values for the complete formulations for each coating of the coating system expressed as percent by weight of each ingredient as described in Table 1 shall be submitted at the time of qualification. Each ingredient shall be identified by generic type, trade name and source. Request for approval of alternate ingredients or change in formulation shall be directed to the qualifying activity (see 6.3). Use of alternate ingredients or change in formulation without prior approval is prohibited (see 6.5).

4. QUALITY ASSURANCE PROVISIONS

4.1 Responsibility for inspection. Unless otherwise specified in the contract or purchase order, the supplier is responsible for the per-

TABLE 1

<u>IDENTIFICATION CHARACTERISTIC</u>	<u>REQUIREMENT</u>
VEHICLE PORTION	
Non-volatiles	$x \pm 2.0\%$
SiO ₂ of vehicle solids	$x \pm 2.0\%$
Weight per gallon	$x \pm 0.4 \text{ lb/gal}$
Ash	$x \pm 1.0\%$
POWDER PORTION	
Total zinc metal	$x \pm 2.0\%$
Total lead, if present	$x \pm 1.0\%$
Carbon pigment	*(1)
Coarse particles	4.0% maximum
Weight per gallon	$x \pm 0.4 \text{ lb/gal}$
MIXED COMPONENT	
Total pigment ²	$x \pm 2.0\%$
Non-volatile content ²	$x \pm 2.0\%$
Volatile content ²	$x \pm 2.0\%$
Weight per gallon	$x \pm 0.4\% \text{ lb/gal}$
Viscosity	3.3.4
Stability	3.3.4
Flash point	3.3.5
Odor	3.3.2
Pot life	3.3.6
Drying time	3.3.9
Coarse particles	4.0% maximum
Cathodic protection	3.3.21
Color	3.3.24

(1) Carbon has been cited as possibly contributing to corrosion. Carbon may be acceptable if (5 years minimum) long service life is shown

(2) May be calculated from analysis of vehicle and dry powder.

formance of all inspection requirements as specified herein. Except as otherwise specified, the supplier may utilize his own facilities or any commercial laboratory acceptable to the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure that supplies and services conform to prescribed requirements.

4.2 Inspection system requirements. The supplier shall provide and maintain an inspection system acceptable to the Government. The supplier is in no way relieved of the final responsibility to furnish paint in accordance with the requirements of this specification.

4.3 Classification of tests. Inspection and testing shall be as follows:

- (a) Qualification tests and qualification reevaluation.
- (b) Quality conformance tests.
- (c) Verification tests.

4.4 Qualification tests. Qualification tests shall consist of all tests specified herein and shall be conducted at a laboratory designated by the Naval Sea Systems Command. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1). The form included in Table 1, as well as OSHA disclosures, shall be completed for each item comprising the coating system with the request for qualification service testing. Sufficient material to apply a complete coatings system over a minimum area of 450 square feet is required. The qualification service testing will be conducted on a Naval ship or, as an alternate, consideration will be given to commercial applications recommended by the supplier and deemed equivalent by Naval Sea Systems Command.

4.4.1 Qualification approval. To be granted qualification, the coating system must pass all tests designated qualification tests in Table 2 and 3.4 service test.

4.4.2 Qualification retention. Qualification retention will be based upon continuing satisfactory service performance as specified in 3.4 (based on inspection reports) and continuing satisfactory quality conformance inspection and qualification reevaluation.

4.4.2.1 Qualification reevaluation. It shall be the responsibility of the qualified supplier to furnish to the Government, at three year intervals, the data necessary to establish the continued conformity of his material to all qualification requirements and evidence that the materials are identical with the formulation which was qualified (see 6.5). These data shall preferably be complete test results of a sample representing current production, tested against all the requirements designated as qualification reevaluation tests in Table 2 and certification that no change in formulation has been accomplished (see 3.21 and 6.5). Where changes have been approved, Table 1 shall be resubmitted. At the discretion of the qualifying activity, test records from current production may be accepted for the reevaluation to the extent they are available, and samples from current production need be subjected to only the tests for which no production test records are available. The qualifying activity shall be notified of the test results. In the event the date for reevaluation has passed and no current production materials or data are available for reevaluation, the supplier shall still be eligible for contract award, but final acceptance of material from such a supplier is contingent upon his

TABLE 2

TEST METHOD

ITEM	QUALIFICA- TION TESTS	QUALIFICA- TION REEVALU- ATION TESTS	QUALITY CONFORM- ANCE TESTS	APPLICABLE METHOD IN FED-STD-141	SECTION OF SPECIFICATION GIVING FURTHER REFERENCE	SECTION OF SPECIFICATION GIVING REQUIREMENTS
Drying time	X	X	X	4061	4.9.6	3.13
Flexibility	X	X	-	6221	4.9.7	3.14
Service test	X	-	-	----	---	3.4
Coarse particles and skins	X	X	X	D185	---	3.8
Flash point	X	X	X	D93	---	3.11
Miscibility	X	X	X	----	4.9.9.4	3.10
Odor	X	X	X	D1296	---	3.7
Mixing	X	X	X	----	4.9.3	3.6
Primer stability	X	X	X	----	4.9.4	3.9
Film properties	X	X	X	----	---	3.12
Adhesion	X	X	-	D2197 Mtd A	4.9.8	3.15
Water resistance	X	-	-	D1308	4.9.9.1	3.16.1
Hydrocarbon resistance	X	-	-	Sec 5D	4.9.9.2	3.15.2
Synthetic fluid resistance	X	-	-		4.9.9.3	3.16.3
Humidity resist- ance	X	-	-	----	4.9.11	3.17.3
Salt spray resistance	X	-	-	B117	4.9.12	3.17.4
Water exposure	X	-	-	----	---	3.17.2
Accelerated weathering	X	-	-	----	4.9.10	3.17.1
Cathodic pro- tection	X	-	X	----	4.9.15	3.18
Color	X	X	X	----	---	3.19
Workmanship	X	X	X	----	---	3.20
Topcoating compatibility	X	-	-	----	4.9.13	3.5
Zinc Content	X	-	-	D2598 & D521	4.9.2	3.2.4

material meeting all the qualifying requirements of the specification.

4.5 Quality conformance inspection.

4.5.1 Lot. For purposes of quality conformance inspection, a lot shall consist of all paint of the same formula designation from a single homogeneous batch or homogeneous blend of batches (for each component where applicable) offered for delivery at one time. Two representative samples of each component from each lot of paint shall be forwarded to a designated Government laboratory for verification tests.

4.5.2 Quality conformance tests. Quality conformance tests for individual lots shall consist of tests so designated in Table 2. The supplier shall provide with each lot of paint results of quality conformance tests and certification of conformance with identification characteristics established at time of qualification (see 3.20 and 4.4).

4.5.3 Verification tests. Verification tests shall consist of any test determined to be necessary for conformance with this specification.

4.6 Test procedures. All tests shall be run in duplicate unless otherwise specified. The paint shall be tested in accordance with the following applicable methods:

4.7 Test panels.

4.7.1 Material. Test panels shall be prepared from sheet steel conforming to QQ-S-698, cold-rolled, and may be of any convenient size and thickness subject to the following limitations:

- a. Unless otherwise specified, panels shall be at least 4 inches wide by 6 inches long.
- b. Panels for the flexibility tests shall be 22 ± 2 mils thick.
- c. Other test panels shall be not less than 60 mils thick.

4.7.2 Surface preparation. The panels shall be washed in solvent (xylene and isopropanol, 1:1 by volume), rinsed in clean solvent, and dried. The entire panel shall be blasted using any suitable equipment and blasting material. The blasting materials shall be free from oil, grease, dirt, water, or other contaminants that would impair the coatability of the panel surface. The panels shall be blast cleaned to a white metal, as defined by SSPC-SP5 (see 2.2). After blasting the panels shall be cleaned by using clean, dry compressed air or a vacuum.

4.7.3 Application methods. After preparation specified in 4.7.2, the panels shall be kept clean and free from fingerprints, rust, etc. Application of the primer shall be accomplished within a maximum of 1 hour after cleaning, or the cleaned panels may be stored in clean toluene or a desiccator for not more than 72 hours prior to coating. Unless otherwise specified, the coating shall be mixed and applied in accordance with the supplier's instructions for spray application, (film thickness of 3-5 mils) except for the flexibility test which shall be 3 ± 0.5 mils. Unless otherwise specified, 24 hours of drying time at room temperature shall be allowed between coats and between the last coat and immersion testing. Cure times shall be from time of application for Type I coatings and from time of application of curing solutions for Type II coatings.

4.8 Test conditions. Unless otherwise specified, all testing, conditioning, curing, etc., shall be conducted under standard laboratory conditions of $75^{\circ} \pm 2^{\circ}\text{F}$ and 50 ± 5 percent relative humidity. Wherever synthetic seawater is specified Formula A of ASTM-D-1141 shall be used. On panels that are to be used for salt spray, humidity, or other tests where corrosion or rusting is a factor, the edges and associated areas 1/4 inch

inward on the panels shall be ignored.

4.9 Test methods.

4.9.1 Zinc dust pigment. The dry zinc dust pigment shall be tested according to the requirements of ASTM-D-520.

4.9.2 Zinc content. The percentage of zinc dust in the dry film shall be determined as follows: Using one unopened unit of primer (one container of liquid vehicle and the companion container of dry zinc dust) accurately determine the total weight of each component by comparing the weight of the full containers to that of identical, empty, clean containers. Determine the nonvolatile content of the liquid vehicle according to the method listed in Table II. Calculate the percent of zinc dust in the dry film as follows:

$$\frac{A \times 100}{A + \frac{(B \times C)}{100}} = D$$

A = Weight of zinc dust

B = Percentage of nonvolatile in the vehicle

C = Weight of vehicle

D = Percentage of zinc in the dry film

For ready-mix primers (one component) the vehicle portion of the primer shall be isolated in accordance with method ASTM-D-2698. The total zinc as Zn in the remaining solids shall be determined in accordance with the procedure described in method ASTM-D-521.

4.9.3 Mixing. A 1-quart sample of the primer shall be mixed according to the manufacturer's instructions. The materials shall be briskly stirred, by hand, during the mixing. The complete mixing shall be accomplished in not more than 5 minutes. After the mixture appears homogeneous or at the end of the 5-minute period, whichever occurs first, the material shall be

allowed to stand for 1 minute. It shall then be poured slowly into another container. The primer shall be observed during pouring and the residue remaining in the mixing container observed for any evidence of lumps or pigment that has not been wetted by the liquid vehicle.

4.9.4 Primer stability. A 1-quart container shall be filled to within approximately 1/2 inch from the top with well-mixed primer. The container shall be sealed and stored $75^{\circ} \pm 2^{\circ}\text{F}$ undisturbed for 4 hours. At the end of this period, the container shall be opened and the primer handmixed for not more than 3 minutes. There shall be no evidence of undispersed lumps of pigment remaining after completion of the stirring. (Small amount of pigment clinging to the stirrer shall not be cause for rejection.)

4.9.5 Coating. Panels shall be prepared, cleaned, and coated in accordance with 4.7 and 4.8. The coated panels shall be examined for conformance with 3.12.

4.9.6 Drying time. Prepare and coat 4" x 6" panels in accordance with 4.7. Examine for dust free drying and dry hard in accordance with method 4061 of FED-STD-141. Four hours after the application of the coating or curing solution, if applicable, subject the panel to the running water test. Position the panel at a 45° angle 10-12 inches from the point of discharge of a stream of tap water flowing at the rate of 1 liter per minute from a standard 3/4" faucet, so that the stream strikes the panel two inches from the top. After two minutes remove the panel and examine for compliance with 3.13.

4.9.7 Flexibility. Two panels prepared and coated as specified in 4.7.2 and 4.7.3 and cured as applicable shall be bent 180 degrees over a 1-inch mandrel in accordance with method 6221 of Federal Test Method Standard No. 141. The panels shall be visually examined immediately to determine

compliance with 3.14.

4.9.8 Adhesion. Prepare and coat a panel in accordance with 4.7 and cure for 48 hours. Make two parallel scratches through the coating to metal, one inch apart, and at least 2" long, using stylus. Apply a 1-inch wide strip of masking tape conforming to PP-T-42, adhesive side down, perpendicular to the scratches. Press the tape down using two passes of a rubber covered roller. Remove the tape immediately in one abrupt motion, exerting the pull at approximately 90° to the panel. Examine the coating for compliance with 3.15.

4.9.9 Fluid resistance properties.

4.9.9.1 Boiling water immersion test. Prepare and coat panels as specified in 4.7 and 4.8. Cure for seven days. Immerse one-half of the panel in boiling distilled water for eight hours. Examine the panel 24 hours after removal from the water for wrinkling, blistering, and adhesion and verify compliance with 3.16.1.

4.9.9.2 Solvent immersion test. Prepare and coat two 6" x 12" x 1/8" panels as specified in 4.7. Immerse in toluene meeting TT-T-548 at room temperature. Examine after 3, 10, and 30 days for conformance to 3.16.2.

4.9.9.3 Hydraulic fluid immersion test. Prepare and coat two 6" x 12" x 1/8" panels as specified in 4.7. Immerse in hydraulic fluid meeting MIL-H-5606 at room temperature. Examine after 3, 10, and 30 days for conformance to 3.16.3.

4.9.9.4 Miscibility test for PASTES-IN-OIL. Place approximately 100 g. of the paste in a cup or other suitable container, add the specified amount of thinning liquid slowly while thoroughly mixing with a spatula or paddle. Both paste and thinning liquid shall be at 21° to 32°C. (70° to 90°F.). Note the ability of the paste to break up readily to form a

uniform, smooth paint of suitable brushing consistency.

4.9.10 Accelerated weathering. Prepare and coat panels as specified in 4.7 and 4.8. Cure for 7-days then subject them to accelerated weathering for 1000 hours in accordance with method ASTM-D-822. Remove and examine for compliance with 3.17.1.

4.9.11 Humidity resistance. Prepare and coat panels in accordance with 4.7 and 4.8; then cure for 7-days. The panels shall be exposed in a humidity cabinet conforming to ASTM-D-1748 and operated at $120^{\circ}\text{F} \pm 2^{\circ}\text{F}$ and 100 percent humidity. The primer shall be exposed for 30 days. After exposure, the panels shall be examined for conformance to 3.5.8.

4.9.12 Salt spray. Panels shall be prepared, cleaned, coated with primer and cured as specified in 4.7 and 4.8. They shall then be exposed in accordance with method ASTM-B-117. Exposure time shall be 30 days.

4.9.13 Topcoating properties. Two panels shall be prepared in accordance with 4.7 and 4.8. After curing the panel shall be coated, in accordance with NAVSHIPS technical manual, Chapter 9190, with an additional 4.0 (min.) to 5.0 (max.) mil dry film thickness of a Navy approved topcoating system in use at the time of qualification. The panel shall then be tested in accordance with 4.9.8 and inspected for adhesion of the second coat to the initial coat of primer.

4.9.14 Cathodic Protection.

4.9.15 30 Days. Prepare two 4" x 6" x 1/8" panels in accordance with 4.7 and 4.8. Mask a 1-1/2 inch diameter circle on one face of each panel with tape, then apply three mils dry film thickness of coating to all exposed surfaces by spraying. Cure for 24 hours and coat the top one inch and associated edges of each panel with Formula 119, MIL-P-15929 or other masking material such as parafin. Cure the panels for seven days at room

temperature, remove the tape from the circle, clean contamination from the surface of the bare metal circle by light sandblasting in accordance with 4.7.2 then immerse in 1200 mls of synthetic seawater in a 1500 ml. pyrex beaker so the water-air interface occurs in the Formula 119. Keep the water level constant during the test by the addition of distilled water. Continue the test until corrosion occurs. Examine for compliance with 3.18.1.

4.9.15.1 48 Hours. Prepare panels as specified in 4.9.15.1 except mask a 2-1/2-inch diameter circle on the panel. Test as specified in 4.9.-15.1 except examine the panels at the end of 48 hours for compliance with 3.18.2.

4.9.15.2 Toxicological data and formulations. The supplier shall furnish the toxicological data and formulations required to evaluate the safety of the material for the proposed use.

4.9.16 Packaging, packing and marking. Preparation for delivery shall be examined for conformance with section 5.

5. PREPARATION FOR DELIVERY

5.1 Packaging. Packaging shall be level A or C as specified (see 6.2).

5.1.1 Level A. The primer shall be packaged according to the requirements of PPP-P-1892. For multi-component primers, each component shall be packaged in separate containers. Quantities in each of the containers shall be such that the entire contents of one container shall be mixed with the entire contents of the companion container to provide the correctly proportioned mixed primer. (For liquid vehicle containers larger than 5 gallons, the appropriate amount of zinc dust may be packaged in two or more containers.). In addition, the companion containers of dry zinc dust and liquid vehicle for units up to and including 1-gallon size, shall

be packed together in the same package. For multicomponent materials, the specified number components shall be considered as one unit of primer.

5.1.2 Level C. Packaging shall be in accordance with the manufacturer's commercial practice.

5.2 Packing. Packing shall be level A, B or C as specified (see 6.2).

5.2.1 Level A. The primer shall be packed in overseas type shipping containers according to the requirements of PPP-P-1892.

5.2.2 Level B. The primer shall be packed in domestic type shipping containers according to the requirements of PPP-P-1892.

5.2.3 Level C. The primer shall be packed in a manner to insure carrier acceptance and safe delivery at destination. Containers shall be in accordance with Uniform Freight Classification Rules or regulations or other carriers applicable to the mode of transportation.

5.3 Marking. Interior and exterior containers shall be marked in accordance with the requirements of MIL-STD-129. In addition, individual containers shall be marked, either by stencil or durable attached labels, with mixing, thinning, application, and curing instructions, as applicable. Each container shall bear the following information:

PRIMER COATING, ZINC DUST PIGMENTED, SELF-CURING, FOR STEEL SURFACES

Specification MIL-P-

Component *

Mix entire contents of this container with * (amount) of component.

5.3.1 Precautionary marking. Each container of liquid vehicle shall be marked with the following precautionary marking:

DO NOT STORE AT TEMPERATURES ABOVE 100°F OR BELOW 35°F

5.3.2 Special marking. In addition to other markings required on the containers, there shall be the following statement: "The volatile content

of this container is not photochemically reactive as defined by rules 442, 443, and 102 (supercedes rule 66) of the Air Pollution Control District of Los Angeles County." (see 6.4)

5.3.3 Additional identification. Each component container, shipping container, and palletized load shall be marked with the appropriate hazardous symbol as applicable in accordance with FED-STD-313.

6. NOTES

6.1 Intended use. The zinc-rich primer covered by this specification is for use on surfaces of steel structures that receive severe exposure to adverse weather, condensing moisture, corrosive atmospheres and marine environments. The primer may be applied under conditions of high humidity and condensing moisture.

6.2 Ordering data. Procurement documents should specify:

- a. Title, number and date of this specification.
- b. Type, class and composition required.
- c. Applicable levels of packaging and packing (see 5.1 and 5.2).
- d. Required type and size of container (3.2.3).
- e. Special marking required (5.3).

*Manufacturer shall enter appropriate data.

6.3 Qualification. With respect to products requiring qualification, awards will be made only for products which are at the time set for opening of bids qualified for inclusion in applicable Qualified Products List QPL ***** whether or not such products have actually been so listed by that date. The attention of the suppliers is called to this requirement, and manufacturers are urged to arrange to have the products that they propose to offer to the Federal Government tested for qualification in order that they may be eligible to be awarded contracts or orders for the products

covered by this specification. The activity responsible for the Qualified Products List is the Naval Sea Systems Command, Washington, DC and information pertaining to qualification of products may be obtained from that activity. Application for qualification tests shall be made in accordance with "Provisions Governing Qualification SD-6" (see 6.3.1).

6.3.1 Copies of "Provisions Governing Qualification SD-6" may be obtained upon application to Commanding Officer, Naval Publications and Forms Center, 5801 Tabor Avenue, Philadelphia, PA 19120.

6.4 Volatile content. Although the container marking specifically refers to the Air Pollution District of Los Angeles County, the paint may be used anywhere else a paint complying with 3.2.2 is allowed. This includes nearly all other air pollution control districts or similar areas controlling the emission of solvents into the atmosphere. Information concerning Rules 442, 443, and 102 (supercedes rule 66) may be obtained from Air Pollution Control District, County of Los Angeles, 434 South San Pedro Street, Los Angeles, CA 90013.

6.5 Conformity to qualified sample. It is understood that materials supplied under contract shall be identical in every respect to the qualification sample tested and found satisfactory, except for changes previously approved by the Government. Any unapproved changes from the qualification sample shall constitute cause for disqualification.

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